

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE FERRY HILL IRON WORKS.

The Rosedale and Ferry Hill Company's blast-furnaces are situated near Ferry Hill Station, on the North-Eastern main line of a way. The manufacture of crude or pig-iron is carried out on a stextensive scale: about 3500 tons of pig-iron are produced weekly. effect this, the position of the blast-furnaces is convenient and advantageous. The iron ore is obtained from Rosedale Mines, in Cleveland, where extensive tracts of mineral property have been purchased or leased by this company. The magnetic iron ore, at first worked at Rosedale, was exceedingly rich and productive; this has become nearly exhausted, and the supply of ironstone is now principally obtained from the Oolitic beds in the same locality. The Rosedale Mines are about 44 miles distant from Ferry Hill; the ironstone is all calcined in kilns at Rosedale, for which purpose small coal is used from the Durham collieries. The coke for the supply of Ferry Hill blast-furnaces is obtained chiefly from the Company's collieries at Coxhoe and Thriplington, also from Thornley and Medomsley. The furnaces are each closed at top, on the cup and cone method, and the gases are utilised for heating the stoves and boilers, only a small proportion of slack being used under the boilers to assist the combustion of the gas. The limestone for fluxing is obtained from Company's quarries near Bishop Middleham, to which a railway recently made. These quarries, though situated in the magnesian limestone formation, produce nearly pure carbonate of lime, containing but a small admixture of magnesia, which is found to be adapted to smelting purposes. The same beds of limestone are worked and brought from Raisby Hill, near Kelloe. Having mentioned the localities from whence the materials used in smelting are derived, it may be observed that smelting operations were first commenced 10 years ago. Three blast-furnaces were then erected, 40 feet in height: one of these remains in its original dimensions; the others were increased, four years ago, to 80 feet in height, by building upon the old work; these are 18 ft. in the bosh, and plated outside. The blowing-engine for these furnaces, built by Aitken and Sons, Glasgow, in 1860, has a steam cylinder of 36 inches, a blowing cylinder of 70 in. diameter, and 8-ft. stroke. It is furnished with a beam-head, imparting a motion by the connecting-rod to the fly-wheel. The valves are worked by four bevel wheels and cams. The air goes at the rate of 14 strokes per minute, day and night. The steam is condensed, but an imperfect vacuum is obtained, owing to deficiency of water. The steam is supplied from five plain cylindrical tanks: these, as well as the hot-air stoves, are heated nearly altogether by the furnace gases. The chimney for causing a draught through the various flues is 125 feet in height only. The lift—raise—materials from the bottom to the top of these furnaces—is on the counter-balance principle; the water is forced by 14-in. horizontal pipe to the tank fixed 15 ft. above the level of the charging plate. The east side of the works is about 150 yards distant from the part described above. The eastern side consists of six blast-furnaces; of these have been five or six years in operation, and were connected 80 ft. in height, 22 ft. at the bosh, and 7 ft. at the hearth. 18 to 19 cwt. of coke is consumed per ton of iron at these furnaces, and 10½ cwt. of limestone per ton of iron. The make of each is over 400 tons of pig-iron weekly. The air is blown into each by tuyeres, at a temperature of about 1000°. There are two lifts in these furnaces, one being put in motion by a 12-horse power vertical engine, on second motion, with drum, wire-rope, and two carriages. The other lift is on the hydraulic principle, constructed by W. Armstrong; the stroke of the ram is 9 ft., and the chains pass over five sheaves. The carriages, ascending and descending at the same time, are connected also by a wire-rope, passing over a sheave. Two blowing-engines, of similar dimensions, are placed in a house for the supply of these four furnaces; they were made at Shildon Works. The steam cylinders are 52 in., the blowing cylinders 108 in. in diameter, 9-ft. stroke; the cylinders are at opposite ends of the beam, with beam-heads for connecting to the fly-wheel. The engines are coupled together, but they can be disconnected and used singly. They are driven at the rate of 14 strokes per minute, pressure of steam is 30 lbs.; the steam is condensed, and a good vacuum obtained. Eight plain boilers, 60 ft. in length, supply the engines; also the engine for the hydraulic apparatus, and that for the steam-lift. The two remaining blast-furnaces, adjoining to those just described, are 103½ ft. in height, 27½ ft. at the bosh, and 7 ft. at the hearth. The average make in each is 550 tons weekly. Consumption of coke is 16 cwt. per ton of iron made, and 9½ cwt. of limestone per ton of iron, when forge iron is produced. The blast is supplied by six tuyeres to each. A cast-iron pipe is carried around each furnace, from which smaller pipes branch off at equal distances to the tuyeres. These pipes are covered by a non-conducting composition, but wrought-iron pipes are being fixed in place of these, 4 in. in thickness. This also applies to the adjoining furnaces; all are plated outside, and closed at top on the cup and cone principle. The blowing engine for the two high furnaces has a 67-in. steam cylinder, 130-in. blowing cylinder, 10½-ft. stroke; the beam weighs over 50 tons, the fly-wheel is about 18 ft. in diameter. This engine was made at the Lilleshall Works in 1868. The steam is condensed, and is supplied from five plain cylindrical tanks 60 ft. in length. The materials are raised to the top of the furnaces by hydraulic apparatus, similar to that already described. The hydraulic engine has two 18-inch horizontal cylinders, 2½-ft. stroke; there are two accumulators; these act on the tanks with a pressure of 480 lbs. per square inch. The metal is run three times in 24 hours at the two high furnaces, and twice in 24 hours from all the others. The Rosedale ironstone, with a small mixture of Spanish ore, is used in all the furnaces, and all qualities are produced, from highly-carbonised grey iron to white forged, according to the requirements of purchasers. It may be of interest to remark that the blast at each furnace is stopped only for about 10 minutes during the time of casting. When the metal and slag have fallen some distance in casting, a little fire-clay is thrown on the fore hearth; the space above this is filled with coke ashes, which soon become hard, and the blast is usually put on again before the metal is entirely run off.

about 2½ tons of the Rosedale raw stone is required to produce a ton of pig-iron, equal 40 per cent. The Rosedale and Ferry Hill Company contemplate erecting more blast-furnaces on the

eastern side of the works. Two blowing-engines are now being erected by Cochrane and Co., of Middlesbrough, on a different principle to the beam-engines already described. The new engines are similar to those erected at the principal works about Middlesbrough, the steam and blowing cylinders rest on cast-iron standards, and the engines are worked at higher velocities than the beam-engines. There are six new boilers for these engines; one is plain, the other five are of the Cornish type, 30 ft. in length. There are two chimneys, 190 ft. in height, to draw off the gases at the east side of the works; the gas being sufficient to heat the stoves and boilers with the addition of a little slack. The main gas tube for the six blast-furnaces is 8 ft. in diameter, the down pipe from each is 4 ft.; none of these have any lining of fire-brick, and are in good condition. The blast tube for these furnaces is 6 ft. in diameter; a tube 4 ft. in diameter extends from the east to the west side of the works, which obviates any interruption to the supply of blast, in case of breakage or repairs to one engine; the pressure of blast is from 3 to 3½ lbs. per square inch, and the whole of the blast tubes are in communication. The blast is heated in cast-iron stoves to the temperatures of 1000°. Two descriptions of stoves are in use, the old pipes are round, 8 in. in diameter, 15 ft. in length, metal 1½ in. thick—these cannot be heated so as to raise the temperature to 1000°, and, in consequence, the new kind of stove, which has lately been erected, and is intended to supersede altogether the old ones, is required to raise the temperature to about 1400°. Four of the new stoves are required for each furnace. Each stove has two rows of pipes, there are nine double pipes in each row, 11 ft. in length, the pipe is of the flat form, the two passages in each being 13 in. by 4 in. inside, divided by a partition 1 in. thick, the whole of the metal being of that thickness, which renders them much lighter than the old form of pipes. The new stoves are calculated to last for 20 years and upwards. The cost of one stove is about 170/., or for four to supply one blast-furnace the cost will be 680/.. The blast enters at one side of a row of pipes, and must pass through nine double pipes before it makes its exit at the other side. The advantages claimed by Mr. Thomas, who is the inventor of this stove, are durability, owing to the great length of heating surface, uniformity of temperature, and lightness of cost. It has been ascertained in practice at these works that no advantage is gained by heating the blast above 1000° temperature, no increase of make was obtained by raising the temperature from 1000° to 1200°, and it is considered a further increase to 1400° would have a similar result. The brick stoves erected at other works are constructed with a view to arrive at this high temperature, securing at the same time durability. They are, however, more costly than those described, the temperature is not uniform, and the dust and impurities are to some extent blown back into the furnaces.

About 500 tons of pig-iron is produced each day at Ferry Hill blast-furnaces, about an equal weight of cinder is produced. To convey these and other materials away four small tank locomotives are employed about the works; one of these was made entirely at the new workshops. The shops consist of joiners', smiths' shop, with ten fires, blown with blast from the blowing-engines, foundry, and fitting shop, containing six machines.

At the Coxhoe Collieries about 1200 tons of coal is raised per day, principally from the Harvey seam; the small is coked, there are 160 round coke ovens in operation. At Thriplington Colliery about 500 tons of coal is raised per day from the Harvey seam—the depth is 220 yards: 58 round coke ovens are erected, and more are intended to be built. The winding-engine at Thriplington has one 42-inch horizontal cylinder, 6-ft. stroke, direct acting, non-condensing, plain drum for round ropes. In each cage two 12-cwt. tubs are raised in one deck, the cages run on wood guides. The ventilation of the mine is effected by a Guibal fan, 36 ft. in diameter, 12 ft. in width; it is driven at the rate of 22 strokes per minute by a 30-in. horizontal direct-acting engine; the machine is, however, capable of being driven at three times this speed. A duplicate engine is fixed in a line with the other, which can be applied in a very short time to drive the fan in case of failure. The fan and engines were constructed at the works of Black, Hawthorn, and Co., of Gateshead, and this principle of ventilating the mine by mechanical means is found to be in every way satisfactory.

An extensive manufactory of fire-bricks is established near the iron works. The fire-clay is obtained from the Coxhoe and Thriplington Mines; after being exposed to the weather, the ironstone and other inferior parts are easily separated from it, and good bricks are produced. About 15,000 bricks are made per day. These are used in the erection of blast-furnaces, stoves, and all the purposes for which fire-bricks are required, both for the works and the cottages building for the workmen, besides a quantity sold in the district.

THE GOVERNMENT INSPECTORS' REPORTS.

In the Supplement to last week's Journal the spirit of an exceedingly important and interesting document was given, in the shape of the annual reports of the various Government Inspectors of coal and ironstone mines for the past year; and, after an attentive perusal of them, we are now induced to make a few general remarks applicable, as we think, to the reports as a whole.

It is a source of the deepest regret to find that some few explosions of a more than usually fatal character increased the total number of deaths from 154 in the year 1868 to 257 in the year 1869; and also that the sacrifice of life from other causes during the past year was larger than that of its immediate predecessor. In the most important of all results, therefore—the saving of human life—we cannot congratulate the country upon the facts and figures disclosed by the reports of the various Inspectors; but in other respects there are features of a satisfactory and congratulatory character. It is impossible to read the reports in question without being most forcibly struck with the evident anxiety on the part of the Inspectors to discharge their duties fearlessly and independently, to expose defects wherever they exist, to condemn carelessness or mismanagement on the part of either men or officers whenever necessary, to point out the preventable causes of accident, and to give wholesome practical advice to avoid a repetition. And this solicitude on the part of the Inspectors has, to an extent at least, found a reflex on the part of the proprietor, the general manager, and the officers of our collieries generally; and although there is still very much yet to be done in the management of our mines, there is at the present moment a greater anxiety to prevent accidents, a more anxious desire to enforce the general and spe-

cial rules by the officers of the pit, and a greater determination to observe those rules by the men themselves than at any previous time in our mining history.

Deplorable as is the annual loss of life in connection with the working of our coal and ironstone mines, the most sanguine can scarcely ever expect the time to arrive when there will be an entire immunity from either explosions, falls of roof, or shaft accidents. The very nature of the work renders such a state of things next to impossible; and we are certainly very much inclined to coincide with the remarks of Mr. Lionel Brough, one of the most able and experienced Inspectors, when he infers that the autumnal equinoxes have some relation (remote though it may be) with the explosions in our mines, which have now occurred for several years past at about the same period of the year. If such a vibratory action does occur, causing the sudden emission of explosive gases, the ordinary ventilation of the pit will scarcely be equal to meet such an emergency and explosions will occur, although if our collieries are well charged with fresh air the effects of such explosions will be considerably mitigated, and valuable lives may be saved. Other causes conspire to render the avocation of a collier more or less dangerous, and so long as "human nature is human nature," so long will the constant exposure to danger render the miner careless and indifferent, and the consequent breach of those salutary precautions which have been enacted for his own safety. No amount of inspection, therefore, can prevent accident, the miner's own safety depends far more upon his own observance of the rules than the visit of the Inspector, however frequent those visits may be, however vigilant the Inspector in pointing out defects, and zealous in having the defects remedied.

Whilst explosions of fire-damp killed 257 persons last year, falls of roof and coal, and sides of working killed no less than 490 men and boys. And here we are bound to remark that in all human probability many lives would have been saved had adequate means been adopted to secure the roofs and sides from falling and slipping. There has been in many instances a praiseworthy anxiety on the part of the collier to prevent explosions, but he has been somewhat too negligent of the proper precautionary means at his disposal to render safe the roof and sides of his own particular heading. The desire to cut a large quantity of coal in his "turn" has, unfortunately, outweighed every other consideration, and he has neglected to securely prop his heading, notwithstanding an abundance of material has been provided by the proprietors, and lies close at hand. Were the accidents from falls, and those arising from shafts, expunged from the list, the Inspectors' statistics would present a far less formidable array, and, consequently, would be of a more satisfactory character. Shaft accidents and accidents from roofs are to an extent preventable; and one of the best practical lessons which can be taught the collier is due regard to the treacherous nature of the roof, and, consequently, the observance of proper precautionary measures for his own safety.

One feature in connection with the reports is the fact that the Inspectors are unanimous in the expression of opinion that no necessity exists for the appointment of a larger number of Inspectors. One would naturally have expected to find, considering the clamour which has been raised in some quarters, that the Inspectors would have advocated an increase in their number, to have divided with them the responsibilities of their arduous duties. The conscientious belief, however, that an increased number of Inspectors would, probably, shift the responsibility from the owners and managers of our collieries, and lead to a greater degree of carelessness on the part of some of the men, has outweighed every other consideration, and the Inspectors still accept the responsibilities attached to their important offices. They, however, strongly advocate a better and more educated class of men who shall act as officers of the collieries, and they regard the spread of a sound, practical education amongst the men as the great preventative cause of explosions and accidents generally. Inspection has done much, and is still doing a vast amount of good—from statistics furnished by Mr. Thos. Evans it would appear that although the quantity of coal raised has increased 63 per cent. since the year 1856, when Government inspection was first introduced, yet the number of deaths remains the same; in other words, there are now the same number of deaths to 103,429 tons of coal raised as there were in 1856, when there were only 63,241 tons raised. Inspection, therefore, has done much good, and is still doing good work—practical lessons are given, and rules rigidly enforced. Perhaps a more frequent inspection of collieries, especially those of a fiery character, would be advisable, but so long as the Inspectors accept the responsibility attaching to their office, and are of opinion that beneficial results would not follow an increase, so long should colliery proprietors and the public generally believe that the present inspection is most conducive to the interests of the miner. Regarded, then, as a whole, whilst the large number of deaths during the past year is a cause for the deepest regret, there are features in the present reports of the Inspectors which afford ground for congratulation and hope with respect to the future. The scientific and mechanical means brought to bear in the winning of coal are more numerous and perfect than at any former time. The general ventilation of pits has greatly improved during the past few years, and Inspectors, officers, and men are all actuated with desire to more rigidly observe the general and special rules. There is a manifest progress in all these respects. The great desideratum is the appointment of a better and more educated class of men as officers, and with the spread of general education we do not despair of seeing a marked improvement in this respect within a comparatively short period.

LEAD MINING IN DEVONSHIRE.

Mines of this class in England and Wales have monopolised a large share of public attention, whilst they have, and still are, contributing in no ordinary measure to uphold the fame of mining as the most remarkable and remunerative industry pursued in the United Kingdom. These facts induce a Correspondent, who has been wandering in the parish of Christow, in Devon, to add a few others as they came under his observation.

After sojourning for a long time amongst various mines he came on one or two which struck his fancy somewhat more than others, from the perseverance which he learnt had been manifested by the shareholders in them. The first of these mines he found to be named Frank Mills—a dividend-paying mine, justly celebrated in the annals of mining enterprise, which is divided into 5000 shares, with a paid-up

capital of 3*l.* 18*s.* 6*d.* per share, and has paid in dividends over 4*l.* per share, whilst the shares are, it is stated, readily saleable at the price paid upon them, virtually doubling the outlay made. In this mine they have several well-defined and masterly lodes, which appear to be of great magnitude, and to increase as depth is attained. Much ground remains unexplored, and the mine looks very encouraging. The great success which has attended the development of Frank Mills has not a little surprised the public, who appear to be wakening up to the fact that very large lead deposits are in this district, and daily experience confirms the opinion that the prosecution of the works of this and adjoining mines to a greater depth will bring about a success almost unprecedented in the annals of lead mining. Consequently about 18 months since a party of spirited gentlemen undertook the resuscitation of Wheal Exmouth Silver-Lead Mine, and from the readiness which Capt. Cock, the resident agent, showed in giving information with reference to the mine, our Correspondent is enabled to give full particulars about it. The mine appears to be working on the Cost-book Principle, a principle well understood in Devon and Cornwall, and is divided into 5000 shares, 1500 of which are held by the purser, whilst the remaining shares are in the hands of gentlemen of the city of Bristol. The agent states that the large lodes in Frank Mills are the boundaries of this set, and that they expect in a very short time to communicate with them, and when they do so the mine will indeed be a marvel, for only 6*s.* 6*d.* per share has been called up, and no call made since November last. A remarkable system of economy is here exemplified, and if our mining agents would but follow the course adopted in this mine it would greatly increase the confidence of capitalists in mining enterprises. It appears that by this system of practical economy the cost per month is on an average only about 14*l.* 0*s.* and the lead and jack raised and sold since January last realised 1068*l.* 6*s.* 10*d.* For a mine in its infancy, as this one is, it is surprising how the purser and agent can so ably limit their expenditure. Our Correspondent learnt that every debt was paid monthly, and that not a farthing was left as a charge on the cost-book; and if this be so the shareholders may well have cause to be pleased with the result which has so far attended them, for they can well leave the purser to paddle them through their financial affairs. From what our Correspondent, who writes without the least bias, could learn and observe, he thinks that long this mine will rank with some of its best neighbours; and, looking at the small sum called up, with the fact that they are now more than paying their costs, and at the same time exploring their ground, it must be evident to the commonest observer that very shortly the mine will enter the Dividend List. In short, nothing appears to be required beyond a little further perseverance, when the shareholders will reap a wonderful reward on the very small capital laid out; and, although much has been said and written against mining, it must be admitted by those acquainted with it that when mining is properly and economically conducted it is neither so uncertain or speculative as many seem to think; on the contrary, when shareholders have implicit confidence in their purser and manager it offers the most profitable advantages to the capitalist, great or small.

These remarks might be considerably extended, but our Correspondent fears he is trespassing on our space too much.

NEW MINES IN OLD DISTRICTS, IN DERBYSHIRE AND NORTH WALES.

Whatever an extended knowledge of physical geology, mineralogy, and the secrets of chemistry may do in the future, it must be admitted by all familiar with the progress hitherto made in mining that, so far as relates to lead and copper, we have been indebted more to accident than to science for by far the greater number of our more important discoveries; also, that the principles by which the accumulation of ore in lodes or metalliferous veins are regulated are almost as little understood or practised as they were centuries ago. This is not said to discourage the exercise of the observing and reasoning powers in relation to the laws and phenomena connected with that assemblage of objects coming within the province of mineralogy, but the fact really is so; and the reason it continues to be so is due, not to the inefficiency of the knowledge itself, but to the number of instances where it exists in which individuals who have mastered the knowledge necessary for their duties have special spheres assigned them, and sufficient to occupy their time and attention in connection with the particular work in which they are engaged. It does not, of course, require a miner to possess a theoretical knowledge of the substances which it is his daily task to seek beneath the surface; because he cannot fail from experience to recognise them, as well as those other substances whose presence or absence are known to present favourable or adverse indications of the minerals of which he is in search. Still, such knowledge would often be of immense service to the man possessing it, by giving to his labour a higher value; and it might enable him, in not a few instances, to reap the advantages of his own discoveries. Instances are constantly occurring, not only in new but in old mining districts, of prizes turning up by the purest accident, where any man who had mastered the conditions in connection with a lode, and the usual combination of surrounding circumstances, might have hit upon it previously; also of discoveries being made where the discoverer, distrustful of his own good fortune, and unable, perhaps, to form sound conclusions from a too partial experience, has allowed others of greater shrewdness and larger knowledge to reap the advantage.

Rambling over some of the hills and along some of the pleasant valleys of England and Wales, and endeavouring as we do so to keep our eyes and ears open, facts now and then worthy of record come to light which might not otherwise get noticed. On the borders of Derbyshire, for instance, the other day we came upon a lead and copper mine just opened, which is deservedly creating quite a sensation in the neighbourhood, but of which we have as yet seen no public notice. It is at a village called Snelston, about three miles from Ashbourne. We approached it from the Churnet Valley, through a country well wooded, hilly, interspersed with pleasant valleys and well-watered meadows. It is not far from Sir Christopher Leighton's, of Ellastone, but is situated on the property of Mr. J. Harrison, of Snelston Hall. It appears from what we gleaned that in August last some men employed in getting limestone came upon lead ore; but the mine was at that time for some reason flooded to prevent the discovery becoming known. Recently, however, steps have been taken to work the veins, although only labourers employed on the estate have as yet been set to work. These men are paid 13*s.* per week, for eleven hours per day, agricultural labourers' wages. It is producing 10 tons of ore per day, worth 14*l.* per ton. A few weeks ago we ventured some remarks upon the old mining districts of Shropshire, which was also referred to in the Supplement to last week's *Mining Journal*, in connection with the visit of the Severn Valley Field Club, on both of which occasions reference was made to instances these hills supply of mining by the Romans.

Last week we paid a flying visit to Aberystwith, another district rich in those natural mineral gifts, which appear also to have tasked the industries both of the early Britons and their Roman conquerors, the latter of whom left so many evidences of their presence on the hills and in the valleys surrounding Plynlimon. And as an illustration of the inexhaustible wealth which Providence has stored in hills, so long worked, we might mention a discovery, a fortnight ago, of a vein of lead, 14 feet in thickness, made by two labouring men, who, in their simplicity, went to inform an experienced captain of mines, who at once perceiving the value of the discovery, went to the proprietor of the land, and gave 200*l.* for the taking. We suppose this would be considered nothing more than "sharp practice," and not very far beyond the pale of morals, as relating to mining; indeed, we might mention instances of the kind in relation to other mines, in which the character of the gentlemen concerned in the transaction would be considered to be above suspicion.

In addition to the above, we might mention an instance of another discovery, also on the Aberystwith side of Plynlimon, where rich mineral ground has recently been developed and purchased, honourably in this instance, we believe, for a couple of thousands of pounds, which to the purchaser—the enterprising manager of an hotel company of the neighbourhood—is likely to turn out an exceedingly profitable speculation. These discoveries took place not far from the foot of one of the group of the Plynlimon hills, the spurs and projections of which, so far from being exhausted of their mines, have

only had their surface tickled, as it were, by men who were, in too many instances, incompetent and unscientific miners.

Has the reader ever been over this grand congeries of hills, the source of a thousand streams, of nearly as many mines, and the father of five important rivers, each fed by tributaries which find their way down precipitous channels, every one of which has been well searched for ore. The rivers are the Severn, the Rheidol, the Llynnant, the Clywedog, and the Wye, which flow in different directions, but some of which, after wandering far apart, unite their waters, like the Severn and the Wye, whilst the Rheidol runs direct by a shorter route to the sea. Plynlimon proper is a sublime group of metalliferous hills, a series of links in the grand Berwyn chain, which constitutes the backbone of Wales. In travelling over it and crossing it at different points, in following its rivers, and diving into its mines, some of which were worked at very early periods of English history, no one can help but be interested with the novelty of the scenes witnessed, and with the manners of the thinly-scattered inhabitants, although sometimes inconvenienced in not finding one out of twenty to answer a question out of his native language. But this is the case only in some portions of the hills; there are others where Dim Sassenach will not be heard in a day's march, national schools and English newspapers having accomplished within a few years what centuries formerly failed to effect.

If the visitor rises early in the morning he may observe on the Aberystwith and Llanidloes sides of the mountain miners from scattered cottages, often situated on the river side, climbing the hill, and converging towards some rude shed, where they put on their underground flannel dresses, and disappear by shafts or holes in the rocks in search of ore. Few steam-engines are employed, advantage being taken of the water-power the streams, diverted and carried long distances, afford for such purposes. From each of the chief elevations, which the Welsh say the name of Pumllyman implies, magnificent views are obtainable, at least, in the absence of those thin white mists which are apt to hang about the summits. On each terminating plateau tradition asserts a battle has been fought. Each has its cairn, where beacon fires have blazed, or where warriors lie entombed; and on one called Stedda Gyrig St. Cyric the guardian Saint of Cymric mariners is said to have had his seat. By the aid of an ordnance map we reached this last rude heap of stones, and rested where the saint was wont to stretch his limbs. No human habitation, not a single sign of man or his works, could be seen; but among familiar forms which rose beyond the clustering out-works at the mountain foot we recognised the Snowdonian, the Cader Idris, Llandinham, and Long mountain chains of hills, with the Breden, the Wrekin, and many minor ones, varying in tint from the most delightful green to the most delicious blue; whilst in contrast with the extreme and middle distances was the immediate foreground of black and barren bog heaps, like earthquake wastes. On this sterile tract, nearly 2000 ft. above the sea, the Severn and other rivers we have mentioned, with the tiniest bubble and the gentlest ripple, have their rise.

THE VARIATION OF THE MAGNETIC MERIDIAN.

SIR.—In the Journal of June 11 you kindly noticed the improvements in Surveying Instruments which I have devised, to provide against the effect of the variation of the magnetic meridian, producing an accumulating error in plans, such as those of mining workings, &c., which are being constantly added to over a series of years. The effect of such variation, if left unchecked, would gradually increase to such an extent as to upset the ordinary calculations to be considered in laying out the workings, and would, perhaps, in some instances also entail serious consequences. This said improvement is accomplished by having an adjusting vernier added to the instrument, and which carries a zero line in such a manner that the needle is easily set to it, instead of to the ordinary zero of the instrument; and then, the adjusting vernier being kept to the proper reading that expresses the true western declination of the magnetic meridian for the time being, the correction is made regularly, without in any measure complicating the reading the angles, or making the entries in the field-book, or of the subsequent work of plotting the survey. The ordinary zero of the instrument, and, as a matter of course, the meridian lines on the plan also, then represents the true, instead of the magnetic, meridian. The said adjusting vernier can be added to existing instruments, of good construction, at an expense of from 2*l.* to 3*l.* As showing the error which the improvement is intended to counteract, the following may be taken as one example:—Let it be supposed that a level heading is now being commenced to be driven forward, and that it proceeds at about an average of 5 chains in each year, and that in a period of about sixteen years it reaches the boundary at about one mile from the pit, and assume the surveys to be taken half-yearly principally, the latter part being yearly. Then, in a tabular form, we have—

Date of survey	Distance surveyed in chains.	Accumulating variation.	Amount of error, accumulating to the "right."
1870, June	2	3 <i>l</i> 3 <i>s.</i>	.22 links and dec.
1870, December	3	7 <i>s.</i>	.65
1871, June	3	11 <i>l</i> 4 <i>s.</i>	1 <i>l</i> 0 <i>s.</i>
1871, December	2	15 <i>s.</i>	.87
1872, June	3	18 <i>l</i> 3 <i>s.</i>	1 <i>l</i> 0 <i>s.</i>
1872, December	3	22 <i>l</i> 2 <i>s.</i>	1 <i>l</i> 9 <i>s.</i>
1873, June	2	26 <i>l</i> 4 <i>s.</i>	1 <i>l</i> 6 <i>s.</i>
1873, December	3	30 <i>s.</i>	.285
1874, June	3	33 <i>l</i> 3 <i>s.</i>	3 <i>l</i> 0 <i>s.</i>
1874, December	2	37 <i>s.</i>	.214
1875, June	2	41 <i>l</i> 4 <i>s.</i>	2 <i>l</i> 2 <i>s.</i>
1875, December	3	45 <i>s.</i>	.394
1876, June	2	48 <i>l</i> 3 <i>s.</i>	.296
1876, December	3	52 <i>l</i> 2 <i>s.</i>	4 <i>s.</i>
1877, June	2 <i>l</i> 2 <i>s.</i>	56 <i>l</i> 4 <i>s.</i>	4 <i>l</i> 14 <i>s.</i>
1877, December	2 <i>l</i> 2 <i>s.</i>	1 <i>l</i> 0 <i>s.</i>	4 <i>l</i> 42 <i>s.</i>
1878, June	2 <i>l</i> 2 <i>s.</i>	1 <i>l</i> 3 <i>l</i> 3 <i>s.</i>	4 <i>l</i> 60 <i>s.</i>
1878, December	2 <i>l</i> 2 <i>s.</i>	1 <i>l</i> 7 <i>s.</i>	4 <i>l</i> 90 <i>s.</i>
1879, June	2	1 <i>l</i> 11 <i>l</i> 4 <i>s.</i>	4 <i>l</i> 16 <i>s.</i>
1879, December	3	1 <i>l</i> 15 <i>s.</i>	6 <i>l</i> 54 <i>s.</i>
1880, December	5	1 <i>l</i> 22 <i>l</i> 4 <i>s.</i>	11 <i>l</i> 99 <i>s.</i>
1881, December	5	1 <i>l</i> 30 <i>s.</i>	13 <i>l</i> 09 <i>s.</i>
1882, December	5	1 <i>l</i> 37 <i>l</i> 4 <i>s.</i>	14 <i>l</i> 17 <i>s.</i>
1883, December	5	1 <i>l</i> 45 <i>s.</i>	15 <i>l</i> 26 <i>s.</i>
1884, December	5	1 <i>l</i> 52 <i>l</i> 4 <i>s.</i>	16 <i>l</i> 33 <i>s.</i>
1885, December	5	2 <i>l</i> 0 <i>s.</i>	17 <i>l</i> 45 <i>s.</i>

Total accumulated error 14*l* 4*s.* 5 links = 32 yards, the level being thrown to the right hand to this extent.

Again, suppose that after standing ten years the drivage of any engine-plane be resumed, and that before the survey of the new drivage is taken 850 links shall have been completed. The "point" of the new drivage is given by "lining" from the part formerly driven, and continued straight; the point, or angle, driven is taken with the dial, for the purpose of showing the new opening, upon the plan. The new drivage is, in fact, in alignment with the old, but the angle taken with the dial, and laid down on the plan, would, by the continued action of the variation of the magnetic meridian, show the new drivage to have turned to the right a total of about 18*l* 6*s.* links, as the magnetic variation would have accumulated an error of about 1*l* 15*s.* in this period.

We may take another case:—There are in a producing colliery some old workings to the dip, which were finished twenty-five years ago, and allowed to fill with water; recently there has been a new range of work opened out to the dip of the former ranges, and also to the dip of the face of the old workings, so long full of water. Let it be supposed that the levels go nearly east and west, and the cross headings nearly north and south, and that from the new level up to the old workings there are 15 chains. It may be that the object aimed at is to pass up a cross-heading to the north, and a little to the west of the old workings, and to drive a cross-hole eastward from the cross-heading to tap the water, and let it out gradually—to say nothing of the magnetic error which would result to the level in bringing it more to the north (assuming that it was driven westward), the error to the cross-heading itself in 15 chains, and with the variation accumulating over twenty-five years at the present rate, would have the effect of bringing the new cross-heading 8*l* 7*s.* links nearer the old working than the plan would show it, and if there has only been allowed what would be fairly sufficient to withstand the pressure of the water, in giving the point to the new cross-heading, without taking the magnetic error into account, the effect of that error would be the reduction of the actual barrier (supposed to be provided) to the extent of upwards of 18 yards. The reduction may in some veins of mineral be quite sufficient to bring about a sudden influx of the water, which may be highly disastrous, not

only to the lives of the men employed in the colliery, but to the property of the proprietor of the works—for when a sudden influx of water occurs the destruction to property is generally great, even if there are no lives sacrificed. Such a disaster may precipitate the assertion that the former surveyor committed an error in his survey to the extent of 18 yards, whereas he may have been quite correct, and the new survey may also have been quite correct; but, in consequence of the magnetic error not being taken into account, the former surveyor may be blamed and saddled with the consequences of an error for which he is no way responsible.

Therefore, I think there should be a constant attention to this fact, and the error provided against by an adjusting vernier zero, which admits of the error being continuously counteracted without complication or difficulty.

Pontypridd, July 9.

WILLIAM LINTERN,
Mining Engineer and Surveyor.

RAILWAY AXLES—CHARCOAL PIG-IRON.

SIR.—The late dreadful railway accident at Newark, which was clearly traceable to the breaking of an axle, led my thoughts back to the first introduction of steam as a means of locomotion on railways, and the great increase of speed, and the proportionate increase of danger consequent thereon. George Stephenson, the first, and at that time the only, great authority on the subject, was at much trouble to find out a quality of iron from which the axles of his engines, &c., could be made of sufficient and reliable strength to safely bear the wear and tear which he knew they must be exposed to, even at the moderate rate of speed, and comparatively light strain, stress, and shock to which they were at that time subjected. His enquiries on this head led him to adopt, and for years specify for, the use of a pure charcoal iron, made from pure hematite ore, smelted with wood charcoal and cold-blast, and the pig-iron so made afterwards refined in charcoal, and thus made into blooms, from which, I believe, most of the axles were then made. The manufacture of these "Backbarrow blooms" has long since ceased, but the facts I now mention will, I think, be remembered and verified by the Mersey Iron Company, by Hawthorne of Newcastle, Fulton of Glasgow, &c. If so great an authority thought it useful to use so expensive a make of iron as this must have been, does it not point out very forcibly the necessity he saw that the axles should be of the best and strongest iron that money could buy? I have said that the manufacture of the "Backbarrow blooms" has long since ceased, but the old firm are still manufacturing the cold-blast charcoal pig-iron at their furnaces near Ulverstone, and in Argylshire, and now their chief market for this pig-iron is amongst the malleable casters, with whom it deservedly stands A. I., and is well known among them, both in this country and on the Continent, as "Lorn" iron. If I am rightly informed, a very good quality of charcoal pig-iron is imported into this country from Sweden and Norway; and it occurs to me that though axles made entirely from charcoal pig-iron might be too costly, it would be well worth trying whether the introduction of a mixture of this pig-iron would not add greatly to the strength, durability, and safety of these axles.

I dare say charcoal pig-iron is double the price of the best coke pig, which, I infer, implies a corresponding difference in value, but it by no means implies that an axle forged from it will bear the same relative cost when finished, as it is clear that if it takes a ton of pig-iron to make an axle, the cost of that axle can only be affected by the difference in the cost of the pig-iron, all else being the same in fuel and labour, so that an axle made from $\frac{1}{2}$ ton of best coke iron at 4*l.*, and from best charcoal pig at 8*l.*, can only differ 2*l.* in cost of the finished axle.

Whenever great strength and perfect ductility, with continuity and elasticity of fibre, is wanted, as in card wire, charcoal pig-iron is essential; and I would suggest that in every part of the structure of a locomotive, passenger or goods carriage, that is exposed to especial strain, the use of charcoal iron, or some admixture of it with other good metal, should be insisted on, as the increase of cost thereby incurred sinks into perfect insignificance when life and limb, without naming property and interrupted traffic, are placed in the opposite scale.

Now that railway property is emerging from the heavy cloud of depression under which it has been struggling for years, I trust that boards of directors will find themselves in a position to pay less regard to first cost, and more regard to permanency, durability, with consequent safety; a future as well as a present.

OLD IRONSIDES.

SIR JOSEPH WHITWORTH ON RAILWAY AXLES.

SIR.—The sad railway accident at Newark, caused by the breaking of a railway axle through unsoundness of material, which has resulted in the death of 18 persons and the destruction of much valuable property, may make railway directors extremely anxious to adopt all possible means of detecting and discovering unsoundness in the material used for railway carriage axles. The best method that can be adopted for the purpose is that of drilling a hole through the centre of the axle, throughout its length, thus opening up to inspection and examination that part of the material which, in the case of ordinary manufacture, is most subject to unsoundness. The hole should be about 1 inch in diameter, and, with suitable mechanical arrangements, might be drilled at an average cost of about 1*l.* 6*d.* per axle. With the outside turned and the inside thus exposed to view, a serious flaw in an axle, which is only about 4*l* 1*s.* in diameter, could hardly escape discovery.

The plan would also diminish the tendency of the axle to get heated, and, by removing the material near the neutral axis, would, under the circumstances, reduce the internal strains, and render the axle safer.

It is of great importance both to give proper diameters to every portion of the length of the axle, and to avoid all approach to sudden change of diameter.

JOSEPH WHITWORTH.

allow the boilers to explode, because it took less money to replace an exploded boiler than it takes to efficiently inspect, &c. In other words, the expense of inspection is not covered by the rate of insurance.

Sir, I am afraid of trespassing on your valuable space, but the importance of truth without any colouring must be my apology for troubling you. That I ought to know something about boiler insurance and inspection you will allow when I tell you that I had served a pretty decent term of apprenticeship to boiler inspection before one or two of the present self-styled "chief engineers" of the assurance companies began learning; and I am also the only independent boiler inspector, and have been so for the last eight years, despite the opposition of the companies and their agents.

With reference to the Select Committee on Boiler Explosions, suppose it to be a fact that a majority of the said Committee determined, by all means, to avoid recommending compulsory Government inspection, and purposely avoid selecting gentlemen as witnesses for examination who are known to favour compulsory inspection, and select witnesses for examination who are known to be in favour and actually in the employ as self-styled chief engineers of boiler assurance companies. Suppose, I say, these to be facts, will the report of the said Committee be as valuable as it would have been had the President and other members of the Committee entered on their investigations unprejudiced?

JOHN SWIFT.

30, Hagley Road, Birmingham, July 9.

MINING—LEGITIMATE AND SPECULATIVE.

SIR.—The sudden change which has befallen the London share market, amounting to panic, is one of the numerous instances of the past, clearly showing the folly of raising the value of mining or speculative property to the ruinous estimate of freehold estates. Some mines have been selling of late to about 40 years' purchase, and at least 10 years above the value of the best freehold estate in Great Britain. It is all very well to write continually buy, just like the butcher in the market place; but there is such a thing, we are told, as buying gold at too dear a price. Hence comes a panic, and good, sound speculations are thrown aside for a time, and may be for years, through such acts of insanity, promulgated by inexperienced men, and an injustice done to legitimate mining pursuits.

This year was ushered in with as much insanity as the year 1845, and four or five successive ruinous years to thousands of persons. It is true the public are greatly to be blamed; they will not buy until there is a panic for speculation, and then everybody buys because everybody is buying. Then something breaks one link in the chain, and all become alarmed, and many suddenly rush into the market, without reason. Some things, through highly inflated imaginations, may have overstepped the limits of reason; yet, on the whole, things in most mining districts are on a sound principle. The great curse to all legitimate mining is that some persons appear to have the gift of writing up fictitious things, that read exactly like truth.

During the last century and a half all legitimate mines wrought in Cornwall were estimated at four years' purchase on the amount paid yearly in dividends. Consequently, the public who invest in mines had some chance, but lately it has not been so. Hence one panic constantly succeeds another. Such has invariably been the case in latter years.—Norfolk-street, July 12. A. BENNETT.

AGENTS' SALARIES—ROCK-BORING BY MACHINERY.

SIR.—As Mr. H. Sewell has not replied to Capt. Julian's letter on these subjects, permit me to inform him that Mr. Sewell, when advocating a rise in the agents' salaries, had reference to public companies, and not to mines worked privately, where high salaries cannot be given. I deny that Mr. Sewell reduced his agents' salary to "the lowest degree." Although the Simulta Dyluan is worked by a single gentleman, as Capt. Julian stated, yet the salary is pounds a month above what many of the public companies give, which figure with tens of thousands of pounds capital. There is one company in the Principality with a capital of £5,000,000, (on paper), and the late manager is still four months in arrear. Mr. Sewell is awaiting the full trial of six-boring-machines at Dolcoath Mine that he may obtain the fullest information before writing again on this subject.—Simulta Dyluan Copper Mine, Pen-y-Groes, July 13. J. ROBERTS.

THE VAN MINE, AND ITS PROSPECTS.

SIR.—Some little time since I had the pleasure of visiting this extraordinary mine, and of seeing the underground as well as the surface operations. Mr. Henry Sewell, M.E., having repeatedly pointed out to me the importance of such visit, not only on account of its immense riches, but also for the sake of gaining instruction which I could not obtain from any other source. And I have to thank that gentleman for his kindness in providing me with the necessary order for making the inspection. In our subterranean tour we were honoured with the company of Mr. George Batters; and Capt. Williams, with all the urbanity of his nature, spared no pains in pointing out to us all that could be seen, and supplying us with all the information we could in reason expect.

I must confess that until then (although I have upwards of twenty years' practical experience in mining) I could form no idea of the nature of the mine, neither could I give full credence to all the statements that were made respecting it; not that I accused anyone of misrepresentation, but I thought it a very easy matter to be deceived. As soon as I went underground, however, my impressions began to change, and as the shades of night are driven away before the rising sun so my unbelief in passing through the various levels entirely disappeared. There is now a vast mine of wealth laid open, and should no further discoveries be made few of the present proprietors or operators will see it exhausted. But apparently there is no limit near, for as they drive deeper the course becomes richer, and I believe that it will prove a grand source from which generations yet unborn will draw their chief supply. I intend at some future time to pay another visit, to see the lode in the 45, as it could not be seen on that day, there being a large outburst of gas and water.

After the company had left the mine, I had some little conversation with Capt. Williams on practical mining, and I was pleased and grateful to hear his bear testimony to Mr. H. Sewell's mining knowledge, and that he was the most clever mining engineer he had yet accompanied underground.

Pen-y-Groes, July 13.

JOHN ROBERTS.

[ADVERTISEMENT.]

VIRTUOUS LADY MINE—QUEEN MINE.

SIR.—Better late than never. Your readers will see by the agent's report that we have a fine lode in the old mine; it is in whole ground, and there is every prospect of its turning out large deposits of ore, as it happens to be about the only place in the old workings at that level, and where so much ore has been found, that has not been ransacked to pieces. Our meeting duty came off at the mine last Wednesday; 68 shareholders attended by person and proxy—65 were for, and only 3 against, the increasing of the set by acquiring a new lease of £500 newly-created shares, to be offered *pro rata* at 1/- each to the present shareholders, by payments of 2s. 6d. per share every three months. This will give us plenty of money to well develop a property that abounds in mineral lodes, 2½ miles long, and 1 mile wide, with copper and the already discovered, that is, at least, considerably helping to pay cost, and six months hence there is, if not a certainty, at least a fair probability, for the several important points connected with the mine, successfully. Tin is now in the ascendant, and, with its vast and never-failing ample water-power there is hardly a mine to be found so peculiarly adapted as this for the successful working of the lodes. Some of the best of the tin we have already found in the lode only a fathom or two from surface produces 1 cwt. of tin to the ton of stuff; however, I care to say very little about this matter. I have a large holding in the concern, and shall have (with pleasure) to contribute a very large portion of the 5000/- new capital, and feel confident of a grand, grand success, only let the mine have time and fair play. I do not want to sell a share. I own I have said a great deal about the mine, and, mark well, the whole of my predictions and statements will eventually come to pass. My motto henceforth will be—*"Deeds, not words."*

QUEEN.—The following is a letter I have just received from Capt. W. Knott:

Queen Mine, Haworthbarrow, June 13.—There is a further improvement in the silver lode in the winze. We have broken this morning about one hundred pounds (100/-) worth of silver. I brought up a stone with me, about half-a-hundredweight, worth, I judge, about fifteen pounds (15/-). I estimate the lode at present to be worth fully seven hundred pounds (700/-) per fathom. Cook's shaft, which is being sunk on the copper lode, has also much improved; the lode is worth fully 5 tons of copper muriatic or fifteen pounds (15/-) per fathom. We are making fair progress in forking the water in the engine-shaft. Capt. Hancock, of the Old Treburget Mine, according to your instructions, is with me, and I shall allow and accompany him underground. I hope to give you further news to-morrow.—W. KNOTT.

My time is so fully occupied that I cannot go over to the mine to-day. If I hear from Capt. Knott to-morrow I will send the letter on to you, to be inserted in the Mining Correspondence.

And this is the mine for which I have received such insults, in the shape of private circulars being sent to mine inspectors—my prospectus being branded as a cheat, a delusion, and an imposition. Capitalists, who would and could have made a little fortune, upon enquiry of some London brokers have been told not to touch the Queen—and why? Simply because they would gain nothing by the introduction. I allude, of course, to a few unprincipled brokers, who live from hand to mouth, and have often, if not daily, to earn a dinner by their wits, which serve to sharpen their appetites before being able to indulge in such a luxury. In answer to the calumnies against me—and, mind you, I have never harmed a mining agent, working miner, or broker, but have done my utmost to honestly benefit mining generally—I quote from my prospectus the first and last phrases, which have caused such derision:—

"The introduction of this great English silver mining property to the world is from clear facts undisputedly destined to become an era of mining history, and add generally to England's wealth and national prosperity."

"What a blessing, what an achievement for the 'Queen' to attain, to be the mainspring of opening up mines of wealth, adding fresh laurels to England's

world-renowned fame for thousands of years, as the first and great mining seat of the world, calling back with a hearty welcome her sons of toil from foreign climes, who, through the temporary depression of English mining, have been forced, from actual want of daily work and bread, to leave its well-loved shores."

I have but few words to add save that, now it is known the Queen is one of the greatest prizes ever discovered in England, my enemies, to "bear" the shares, have rumoured in London that we are working without a lease. It is as false as it is wicked. We have a splendid set, of nearly a mile in length, held upon the most favourable terms from the Duchy of Cornwall and Miss Olympia Bennett, a large landed proprietor in the neighbourhood. Permit me to inform the world that I know exactly what I am about, and if not naturally of a shrewd temperament, am sufficiently wide-awake to secure sets before commencing to work them.

One little matter has not been spoken of lately—the mercurial amalgamation. It is a success, and, under the direction of Capt. Knott, and our chemist, Mr. Doble, we can make silver ores producing as little as 12 ozs. of silver to the ton give a good profit, and intend putting up the necessary and more extensive machinery forthwith. It is a private affair, and for the present, in answer to many enquiries, especially from Wales, I have given instructions that no one enters the laboratory, or is present at the treatment of the process. It will be for the benefit of the world in its due and proper season.

I have now just upon a dozen sets offered to me, but I shall carefully use my own judgment, and take the advice of practical men, and bring before the world only those things which are as certain of success as can possibly be in the somewhat, but not always necessarily so, speculative enterprise of mining.

Tamar House, near Tavistock, July 13. THOS. J. BARNARD.

THE QUEEN MINE.

SIR.—This mine is a marvel of riches. A discovery was made last week on the silver lode, and valued by the agent at 500/- per fathom. Thinking it a mistake, I visited the mine to-day, and was surprised indeed to hear from Capt. Knott that he had this morning brought to surface 300/- worth of silver, and that the lode was worth nearer 150/- per fathom than 500/-, and that in another fathom or two sinking, in all probability, it would be worth 1000/- per fathom. This is certainly a grand discovery of precious metal, and I must say that great credit is due to Mr. T. J. Barnard, the energetic secretary to the Queen, for the very able way in which he is developing this property. The mine has always paid its way, and now it will soon pay large dividends.

Tavistock, July 13. F. CROSS.

THE TERRAS TIN MINE, AND ITS MANAGEMENT.

SIR.—Having heard and read a great deal about the Terras Tin Mine, and although not an investor, I feel an interest in mining, not only for the labouring classes, but for the good of the adventurers also. During my leisure hours in this neighbourhood I have made frequent visits to Terras, and after various close observations I am bound to say I think it all that it has been represented in the different ways in which I have seen and heard it put before the public. In my opinion, had the engine not been started until the dressing-floors and the machinery required for dressing the tin had been completed, on the whole, it would have been better, as it is, large quantities of stamped tin-stuff is accumulated, not being able to dress as fast as it is stamped. The slimes, too, is carrying the way not in small quantities. The agent informed me it was the intention to make slime-pits with as little delay as possible, but whilst they are arranging all these necessary things they are losing tin enough to pay for their erection. Again I will venture my opinion, and say that, should they stop the engine for a week or two, and in that time put all their force on in completing dressing-floors sufficient for the stamps erected, make slime-pits, get the short level driven through to the pit on the north side of the parish road, &c., they would be in a position to work to their satisfaction. If I were rightly informed, the short level will be some 3 or 4 fms. deeper than the deepest point now being worked. All the stuff yet carried to the stamps has been from near surface. On my visit last week I observed the workmen had got down at one point, I think, 18 feet from surface, and here the tin-stone was much improved. Some they were getting was rich, and there is not a shadow of doubt but it will make a rich paying mine. I must not close this sketch of my observations without saying there is being driven a second and deep level, which will give extensive backs, and by which level the tin-stuff will be trammed direct into the stamps. The tin that is now dressed and ready for market appears to be of good quality. I was allowed by the obliging agent to take a sample, that I could have it tested, and know its value, which it is my intention to do.

L. H. July 13.

[For remainder of Original Correspondence, see this day's Journal.]

FOREIGN MINING AND METALLURGY.

The state of the French coal basins has not experienced any important change. The orders received are as numerous as ever, and the extraction is everywhere pushed forward as actively as possible. There are scarcely any stocks, and the production of some descriptions is far from responding to the consumption. A slight advance has occurred at Lens, and has been generally accepted; a considerable part of the production is engaged before hand until the end of the year. Paris industries have almost all renewed their contracts, and have by consequence accepted the majoration of prices demanded by the trade. Deliveries both by canal and railway have been made on a large scale. The French metallurgical markets remain in much the same state as for some time past. In the Champagne district the works are largely provided with orders for articles of every description; coke-made iron remains, nevertheless, somewhat quiet. Re-fining pig has been in some demand of late, and mention is made of the conclusion of a contract for mixed pig—half charcoal-made, half coke made—at 4/- per ton. The Champagne Committee of Forges-terras has just held its ordinary monthly meeting. The meeting decided that the committee should address to the Minister of Public Works a petition soliciting a suppression of navigation dues; further, the meeting adopted the ideas of Mr. B. St. L'Estoile, secretary of the Association of Charleroi Coalowners, on the subject of the purchase of the Sambre and Junction Canal. The object of the purchase would be to facilitate the access to the markets of the Haute-Marne of the coal of the Charleroi district. Pig continues to enjoy a good demand in the Moselle; despatched refining is held at 2/- 17s. 6d. to 2/- 18s. per ton; producers are rather seeking contracts, with deliveries to be made at remote date. Iron maintains a good position; all the rolling-mills are working with the greatest activity, in order to execute important orders which they have received. The foundries—and especially those producing pipes—have important orders on hand; the Pont-à-Mousson Works have secured a contract for two towns in Germany and Switzerland. It is stated that M. Labbé is about to establish a fourth furnace; M. d'Adelsward is building a third; and the Providence Company is also constructing a third on cast-iron columns. MM. Metz, of Ech, are erecting from Pont-à-Mousson the castings required for the construction of two furnaces. MM. Brasseur are also occupied with the foundations of some furnaces. MM. Chevalier, Chevillay, and Co., of Paris, have obtained by tender a contract for plant for the works of the Oifen Railway (Hungary). The Eastern of France Railway Company has ordered 4000 pairs of wagon wheels from MM. Dietrich and Co.; the terms have not transpired. The Charleroi Railway Company has ordered 1680 pairs of wagon wheels—1100 from MM. Petin, Gaudet, and Co., and 580 from MM. Carpenter, at 18/- per ton, delivered at Paris. The imports of pig and castings into France in the first four months of this year compare as follows with the imports in the corresponding period of 1869:—

	1870.	1869.
Duty free	Tons 32,426	Tons 34,567
Ditto for shipbuilding	1,730	734
With payment of duty	946	1,331
 Total	36,102	36,632
As regards iron and plates, the totals stand thus:—		
1870.	1869.	
Duty free	Tons 16,104	Tons 9,636
Ditto for shipbuilding	2,496	3,137
With payment of duty	1,559	851
 Total	20,159	13,624

The quantity of duty-paying machinery imported into France in the first four months of this year was 8639 tons, against 7641 tons in the corresponding period of 1869. The quantity of minerals imported into France in the first four months of this year was 168,245 tons, this total being made up as follows:—Belgium, 36,605 tons; German Association, 35,298 tons; Spain, 27,729 tons; Italy, 9551 tons; Switzerland, 204 tons; Algeria, 58,051 tons; and other countries, 807 tons.

There is nothing very striking to report in connection with the state of the Belgian iron trade. The works continue actively employed, and the price of iron is sustained. Iron has generally made 6/- 16s. per ton. Plates are firm at 9/- 4s., 10/-, 13/- 4s., and 18/- per ton for Nos. 2, 3, 4, and 5. The Belgian coal trade continues in a satisfactory state. The extraction is pushed in the different basins to the utmost limits, and the production is taken off from day to day. Supplies of coal for domestic purposes are being laid in freely, and at firm rates. Industrial coal is also much sought after. The Tren-Kalsin Coal Company has obtained a contract for three lots of coal—of 4000 tons each—for establishments of public assistance at Paris; all the competitors tendered at high rates. The production of coke for metallurgical purposes cannot keep pace with the orders on hand. This description is scarce, and sells at 16s. 10d. per ton, for good qualities, both

as regards iron and plates, the totals stand thus:—

1870.

The net profit realised last year by the Châtillon and Commeny Forges Company, including the balance brought forward from 1868, was 56,071/-, admitting of the distribution of a dividend of 12/- per share, and the application to the reserve of a sum of 24,383. The balance of the dividend, or 14s. per share, will be payable after Sept. 20. The shareholders of the Montluçon St. Etienne Colliery Company have made certain changes in its statutes, &c., the duration of the company has not been limited to any particular date; the share capital remains at 56,000/-, represented by 2800 shares. The affairs of the undertaking are to be administered by a council composed of five members, elected for five years. The Courcelles-Nord Colliery Company commenced the payment yesterday (June 15) of the dividend for 1869, or 3/- per share. The Val-Benoit Colliery Company has been paying a dividend of 1/- per share for 1869-70. The St. Leonard Company, at Liège, for the manufacture of iron, steel, tools, machinery, &c., will pay, on August 1, its dividend for 1869-70, or 2/- per share. The Sclessin Blast-Furnaces, Iron Works, and Colliery Company has been paying interest for 1869-70, or 1/- per share.

No material change has occurred in copper at Paris. Chilian bars is quoted at 69/- 12s. per ton; ditto ingots, 73/- per ton; and Corocoro mineral, 72/- per ton. Tin has been very heavy; transactions have been nearly nil, and quotations have been purely nominal. At Rotterdam tin has been neglected, and prices have declined. Banca has made 78 fls.; and Billiton, 77 fls. The uncertainty as to what

may happen as regards Spanish affairs is not calculated to revive business. Lead has remained quiet, with a downward tendency. At Paris, Spanish has made 18/- 4s.; French, 18/- 8s.; English, 18/-; and German and Belgian, 18/- 8s. per ton. At Paris rough Silesian zinc, delivered at Havre, has made 19/- 4s. per ton; other good marks, 19/- 4s. per ton; ditto delivered at Paris, 19/- 8s. per ton; rolled zinc of the Vieille Montagne Company, 28/- per ton. The German zinc markets have displayed no animation.

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

GOLD.—The operations of gold digging and gold mining have been considerably interrupted by the dry weather. An interesting ceremony took place on May 7, when a valuable gold-bearing reef in the Gumeracha district was christened the Conlin, after one of its proprietors. At the German reef the workings are being proceeded with, and appearances are still very promising. There is also good news from the South Rhine, where reefing is being carried on. The prospectus of a new company to work an auriferous reef near the Onkaparinga has been issued. The men working on Mr. J. Lang's property at Meadows have now erected a puddling machine, and are obtaining favourable results. A stone of ore picked promiscuously from a large heap of refuse at the Bahannah Mine has, on being crushed, yielded a quantity of gold in the proportion of 50 ozs. to the ton. At a meeting of the Adelaide Mining Company the directors were empowered to lease any part of the property upon a royalty. In a general way, however, the gold news is unimportant.

SILVER.—At the Esmeralda Silver Mining Company meeting it was decided to recommend the directors to raise 5 tons of ore to be forwarded to England for a report as to its value. Private enterprise has just opened up a silver-lead mine at Angaston.

COPPER.—Mr. S. Higgs has

I have set the following tribute ground about this shaft:—From the bottom of the 10 to the back of the 25 fm. levels by four men, at 5s. in 12, three men at 8s. in 11, and two men at 9s. in 11. The tributaries are raising a fair quantity of ore—indeed, at no past time did the floors present such signs of prosperity, but of course if no exploratory works are carried on simultaneously this state of things cannot last. It seems a great pity, now that Hall's shaft is put down to the 45 fm. level at great expense, and Deebie's shaft held to the 25 fm. level, with all expenses of erection done with for the present, that there should not be necessary funds at disposal to carry on dead work, and the more so because other parts of the mine are beginning to pay their own way; 2000 per month now would do more towards developing the mine than 4000 per month a year ago. It is my duty to say that the good opinion I expressed of this mine when I first inspected it I have seen no reason for changing, but, on the contrary, as the lode has been further explored, my faith in its ultimate success has strengthened." About 130 tons of ore were on hand, or being dispatched, which would probably realise about £500. The committee had found it necessary to instruct Captain Anthony to confine operations to parts of the mine which were immediately productive, and to use every effort to develop these until they should have received further funds from the directors in London and exploratory work could be continued. [The directors are taking steps to issue the remainder of the company's twelve-and-a-half per cent. debentures to the shareholders with the least possible delay.

ENGLISH AND AUSTRALIAN (Copper).—Port Adelaide, May 23: The manager was still at Newcastle superintending the completion of the new smelting-works. There were three furnaces and one refinery at work at Port Adelaide. The stock of coals was 601 tons. A shipment of 100 tons of copper had been made since the date of last advices, and a further quantity of 111 tons was ready for shipment.

SCOTTISH AUSTRALIAN.—The directors have received advices from Sydney, dated May 18 last, with reports from the Lambton Colliery up to the same date. The sales of coal for the month of April amounted to 11,946 tons. The colliery viewer reports that the recent heavy rains in the Newcastle district had not impeded operations at the mine, further than giving for a time a little extra work in pumping.

ANGLO-AUSTRALIAN (Gold).—Captain Raisbeck, May 21:—East shaft has been sunk to a depth of 73 feet. At 70 feet a leader was struck 2 in. thick, underlying west 4 feet in a fathom; and stopped sinking at present shaft at water level.—Engine-shaft (No. 1): Recommended sinking on the 25th ult., and a depth of 29 feet 4 in. has been obtained since that date, making the total depth of shaft 119 feet 4 in. The sinking is alternate runs of sandstone and slate, heavily charged with mudstone. The influx of water at the rate of four gallons per minute. I would recommend the section to "wring" to this shaft.—Winze Shaft, No. 1: Present depth, 67 feet; touched a small leader at 65 feet; quartz in bottom of shaft.—Winze No. 2: I am under the impression that the engine-shaft has tapped the water in south shaft (No. 2 Winze), as it is sinking at the rate of 2 in. per diem since the 14th inst.

PORT PHILLIP AND COLONIAL (Gold).—Mr. Bland (Clunes, May 20) reports: The quantity of quartz crushed during the four weeks ending April 27 was 4288 tons. Total gold obtained, 761 ozs. 8 dwt., or an average per ton of 3 dwt. 13 grains. The receipts were 2580. 5s. 4d.; payments, 3670. 14s.; loss, 600. 8s. 8d., which, added to the debit balance brought forward from last month, makes a total of 5040. 8s. 2d. to the debit of the joint account. Return for the two weeks ending May 11—Quartz crushed, 1886 tons; total gold obtained, 442 grs., or an average per ton of 4 dwt. 16 $\frac{1}{2}$ grains.

FOREIGN MINES.

DON PEDRO NORTH DEL REY (Gold).—Telegram: Produce for May, 6259 oits.; weighed to June 18, 2636 oits.

CHONTALES (Gold and Silver).—The directors have received advices from Mr. Bland, dated June 8—Remittance of gold, 407 ozs., from 1083 tons of ore; average yield, 7 $\frac{1}{2}$ dwt. per ton; cost, £5581, which includes the large item of £140 for freight of machinery to the mines. A much larger proportion of the ore has come from the bottom level of San Antonio than before. Mr. Bland states that he expects to get this level opened out to the western end during the present month (June), and also to open out the stope to the westward of the present ones. The deep new cross-cut has been driven 25 varas.—Trinidad Mine: The lode in the end and rise is extremely poor. A short cross-cut has been put out from the end to intersect a branch that went off south.—Consuelo Mine: A short cross-cut has been driven from the deep adit level south. Small strings of ore only have yet been found. The wet season has set in early, and the water has been applied to work the stamps to relieve the steam-engine. The health of the establishment is good.

San Antonio Mine, June 7: Herewith I beg to hand you my report on the above mine, showing the work done for the past month:—No. 1 stope, in back of No. 5 level, west of Piper's shaft, has been stopped 112 varas; lode about 2 ft. wide, worth 8 dwt. of gold per ton. No. 2 stope, in back of No. 5 level, west of Piper's shaft, has been stopped 29 varas; lode 3 ft. wide, worth 9 dwt. of gold per ton. No. 3 stope, in back of No. 5 level, east of Piper's shaft, has been stopped 181 varas; lode 7 ft. wide, worth 7 dwt. of gold per ton. A stope in the back of the deep adit level has been risen and stopped 54 varas; lode 3 ft. wide, worth 4 dwt. of gold per ton. No. 5 level has been driven west of Piper's shaft on the course of the lode 25 varas; lode about 2 $\frac{1}{2}$ ft. wide, worth 6 dwt. of gold per ton. I expect to hole this level through the hill very shortly. In driving on the course of the Santa Domingo lode, east of the new shaft, the lode is 4 ft. wide, worth about 3 dwt. of gold per ton. The deep cross-cut has been driven 25 varas; ground very good for driving. Our mine at present is in very good working order. The quartz is set to the stamps for the past month in 103 tons, which is estimated to be worth 8 dwt. of gold per ton, in all about 406 ozs. of melted gold.—JOHN KINT.

Trinidad report for May: During this month the Trinidad level has been driven east on the course of the lode 5 $\frac{1}{2}$ varas; the lode is small and poor. We have suspended the driving of this end, and put the men to drive a cross-cut south to cut the south part of the lode, where we hope to meet with better results. The stope in back of this level has been stopped 22 $\frac{1}{2}$ varas; the lode is 2 $\frac{1}{2}$ ft. wide, yielding about 3 dwt. of gold per ton. We have suspended these stope and put the men to rise; and as soon as this rise is put to surface we intend driving a shallow level east from the same, where we hope to meet with some good paying quartz. About 70 tons of quartz have been sent to the stamps, yielding 3 dwt. of gold per ton.—W.M. EVANS.

EXCHEQUER.—J. Chalmers, Bullionia, June 1: From the bottom of the winze a cross-cut was driven through the ledge east 21 ft.; here the ledge appears to be somewhat broken, and does not show a well-defined hanging-wall, owing probably to the circumstance that a little beyond and to the north of the cross-cut the Accacia joins the main ledge, at which junction I expect to find good ore; this drift should be continued 20 or 30 ft. further. From the same level (the 50) a drift was run on the footwall, north 16 ft., preparatory to taking out the ledge by stonings between this and the tunnel level. I have at the mine a new and more powerful windlass, the construction of which has necessitated a very considerable enlargement of the hoisting chamber, both vertically and horizontally, which I am happy to say is all but completed. In consequence of the number of men required to perform this work, being all at one time in the tunnel or chamber, the air became so vitiated that I had to suspend work temporarily in the air-shaft, which was, therefore, raised only 2 ft. during the month; but, as nearly the whole of the timbers in the old tunnel were in a dangerous state, I have had the air-shaft men taking these out and re-timbering, which has been done to the extent of 95 feet. Part of the foundation for the dwelling for the men has been graded, and I have been able to make a very satisfactory contract with Messrs. Gilman for the timber required for the erection—\$23 per 1000 feet. These operations have not only prevented my raising more ore, but put it out of my power to have another batch sorted for Reno, and I was unwilling to send more without sorting. By the end of next week I hope to have the whole of this dead work completed, and the new windlass in place, when work will be resumed in the air-shaft, and the stonings of the ore commenced in level 1, north from the 50.

NEW WILDBERG.—J. Sanders, July 8: East Mine: The drivage east at the Erbstollen is yielding stones of ore occasionally, but nothing to value. The stope above the level remains as last week, worth 1 $\frac{1}{2}$ ton of ore per lachter. Conder's drivage at the 70 remains as for some time past, with the exception of a little more copper ore in the middle of the drivage.—Carter's Shaft: The Erbstollen Erzkammer at the 70 lachter level is yielding 1 ton of ore per cubic lachter. A cross-cut is commenced from the Dornergang to communicate with this place; the ground at present is composed chiefly of grawacke, with small branches of teel-stone in it, but unproductive. A tribute pitch in Davey's stope, below the 60 lachter level, is yielding 2 tons of ore per cubic lachter. A pitch above the 60, on the junction of D. nergang and Johannestrum, is worth 2 tons per cubic lachter. A pitch above the 50, on Weitungs-mitral, is worth 1 $\frac{1}{2}$ ton per lachter. The pitches on and near the Dornergang Erzkammer, are yielding their usual quantity of ore, 1 ton per lachter on an average.—Beck's Workings: The drivage of the 70 west will now be carried on by four men as fast as possible, with a view of proving the ground between Beck's and Blumen-gang. The tribute pitch b-low the 60, east of the machine-shaft, remains as last week, worth 1 $\frac{1}{2}$ ton of ore per lachter.—Blumen-gang: The 60 lachter level is communicated, the ventilation good, and working at the different places will be resumed in a day or two.

CAPE COPPER.—Frank Kent, May 15: Spectakel: The 36 fathom level, south of Arend's pitch, was driven last month 6 ft. 7 in., which produced at the rate of 3 tons of ore per fathom; this month it has been set to two men and two labourers, for 1 fm., at 16 ft. per fathom, out of which 3 ft. 4 in. has been driven; total length of level 9 ft. 11 in.; the ore in this place has fallen off, and the ground much harder, and should it be found in a little further driving not to improve, we think it advisable to stop it, and put the men stonings away the ore already gone through. The 36, east of Arend's pitch, was last month driven 4 ft. 10 in., producing about 2 tons of ore per fathom, and was this month set to two men and two labourers, for 1 fm., at 16 ft. per fathom, out of which 3 ft. 4 in. has been driven; total length of level, 10 ft. 10 in., which has been driven; it is re-taken by two men and two labourers, for another fathom, at 16 ft., and the end will yield about 1 $\frac{1}{2}$ ton per fathom. The 36, west of Arend's pitch, was last month driven 7 ft. 10 in., producing about 2 tons of ore per fathom, and was this month set to one man and three labourers, for 1 fm., at 16 ft., out of which 5 ft. 6 in. has been driven; total 13 ft. 4 in.; the end will now yield 1 $\frac{1}{2}$ ton per fathom. The object in driving the level, besides opening the ground, is to communicate it with the incline; the distance to be driven is about 8 fms., which, when done, a great saving will be realised in being able to tram all the stuff from Arend's pitch, instead of having to haul it up to the 27 by hand, the way in which it is at present obliged to be done. The incline was last month sunk 8 feet, through ground producing 3 tons of ore per fathom; this month it was set to one man and eight labourers, for 1 fm., to be carried 13 ft. wide and 8 ft. high, at 50 ft., out of which 4 ft. 4 in. has been sunk; it continues to yield about 3 tons of ore per fathom, and the ground shows favourable appearance for further improvement, it being in the bottom spangled with ore throughout; depth, 12 ft. 4 in. The stope in the bottom of Arend's pitch has lately improved, and will yield 5 tons of ore per fathom; it is now worked by one man and eight labourers, for 7 fms., at 8 ft. 10 in. per fathom. The stope in the back of Arend's pitch will yield 2 tons of ore per fathom, and is now worked by one man and four labourers, for 10 fms., at 21 ft. 10 in. per fathom. The stope under the 25 east still continues to look well, yielding 6 tons of ore per fathom; and is now worked by one man and eight labourers, for 3 fms., at 11 ft. per fathom; this place is now 4 $\frac{1}{2}$ fms. under the 27, over which some of the best bundles of ore were met during the time I have been here. The stope in the back of the 27 has this week improved, now producing 3 tons of ore per fathom, and

is worked by one man and five labourers, for 6 fm., at 6 ft. 10 in. per fathom; this is east of Thomas's pitch; and the stope in the same level, west of Thomas's pitch, has improved and will also yield 3 tons of ore per fathom; it is at present worked by one man and five labourers, for 10 fms., at 4 ft. per fathom. Our raisings for last month are 195 tons, averaging 3 $\frac{1}{2}$ per cent. We are still, I regret to say, short of water for dressing purposes, and this is owing, to some extent, to want of timber to erect the required machinery for pumping the water back from the lower part of the floors, in order to make the most of it, which, when done, we shall, of course, with our present underground raisings, increase the return.—P.S. Please note the total depth of the incline is 37 fms. 2 ft.

[For remainder of Foreign Mines see to day's Journal.]

GRYLLS'S ANNUAL MINING SHEET,

FROM JUNE 30, 1869, TO JUNE 30, 1870.

Containing the Quantity of Copper Ore sold from each Mine, British and Foreign—Average Price per 21 cwt., and the Amount of Money—The Average Standard, Produce, and Price for the Year, both in Cornwall and Wales—The Total Amount of Ore, Fine Copper and Money—Each Company's Purchase—And the Particulars of Copper Ores sold at the Ticketings in Cornwall from June 30, 1851, to June 30, 1870.

CORNWALL.

Mines.	Ore.	Amount.	Price.
Basset, Wheal.....	1,608	28,126 6	£5 1 0
Bampfylde.....	409	3,700 13 6	2 1 0
Bedford United Mines ..	923	2,761 18 6	3 0 0
Belstone Mine.....	156	1,064 3 0	6 16 6
Botallack Mine.....	66	387 17 0	5 17 6
Brookwood.....	735	3,602 11 0	4 18 0
Buglehole's Ore.....	55	257 12 6	4 13 6
Buller, Wheal.....	57	257 19 6	4 10 6
Carroll.....	55	646 5 0	11 15 0
Car Brea Mines.....	2,041	8,717 12 6	4 5 6
Carri Camborne.....	255	482 17 6	2 0 0
Clifford Amalgamated.....	7,062	29,173 15 6	4 2 6
Copper Hill.....	384	1,397 10 0	3 13 0
Craddock Moor.....	821	3,077 2 0	3 15 0
Crebrier, Wheal.....	378	1,233 4 0	3 5 0
Crelabel, Wheal.....	1,146	3,161 16 6	2 16 0
Crener & Wh. Abraham.....	2,085	5,513 11 0	2 13 0
Devon & Cornwall United.....	127	322 12 6	2 11 0
Devon Great Consols.....	15,910	55,521 13 6	3 10 0
Dolcoath.....	76	295 14 6	3 18 0
East Basset.....	220	724 11 6	3 6 0
East Caradon.....	2,656	10,617 5 6	4 0 0
East Carn Brea.....	758	2,372 8 6	3 2 6
East Pool.....	1,727	4,900 2 6	2 16 6
East Ro-warne.....	653	2,523 18 6	3 17 6
East Seton.....	129	765 15 6	3 18 6
East Wheal Grenville.....	823	3,261 1 0	3 18 0
Emily Henrietta, Wheal.....	356	1,658 4 6	4 7 6
Friendship, Wheal.....	809	4,167 1 0	5 3 0
Furdon.....	135	385 13 0	2 17 0
Gawton Copper Mine.....	1,199	4,044 0 6	3 7 6
Glasgow Caradon.....	1,499	5,144 17 6	3 8 6
Gonamena.....	641	2,322 19 6	3 12 6
Great North Downs.....	983	4,399 19 0	4 9 6
Gunnislake (Clitters').....	765	4,156 13 0	5 8 6
Hington Down.....	229	596 4 0	2 12 0
Kelly Bray.....	1,593	4,793 19 0	3 0 0
Kitty, Wheal.....	75	375 10 6	5 0 0
Levant.....	149	1,387 12 6	9 18 0
Marko Valley.....	5,926	22,674 14 6	3 14 6
New Pembroke.....	486	4,050 5 6	8 6 6
New Treleigh.....	89	181 7 0	2 1 0
North Down.....	740	4,416 4 6	5 19 6
North Pool.....	81	332 16 0	4 2 0
North Roskem.....	108	506 13 0	4 14 0
North Tresekby.....	1,333	6,192 16 6	4 13 0
North Wheal Crofty.....	148	1,448 19 0	9 16 0
Ogol Tor.....	1,625	4,042 7 6	2 11 6
Phoenix Mines.....	2,114	8,850 5 0	4 3 6
Polden Mines.....	1,095	3,955 3 6	3 12 0
Prince of Wales.....	159	6,332 1 0	5 9 6
Prospect United Mines ..	164	569 7 0	3 2 0
Rose, Wheal.....	347	1,212 4 6	3 10 0
Russell, Wheal.....	348	994 18 6	3 0 0
Seton, Wheal.....	2,406	7,410 2 6	3 1 6
South Caradon.....	6,670	46,501 10 0	6 19 6
South Crofty.....	1,992	5,582 8 6	2 0 0
South Frances.....	544	3,082 6 6	5 13 6
Sundry small mines ..	618	2,299 17 0	3 14 6
Trecroft	66	221 6 0	3 7 0
Tresavean	96	310 8 6</td	